



# *Renewable energy - a look into the future*

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**GROWING THE RENEWABLE ENERGY & CLEAN TECHNOLOGY ECONOMY**

# Who we are

We are the largest trade association for renewable energy and clean technologies. Our 500 + member organisations range from energy utilities & renewable energy developers working across multiple technologies and solutions through to innovative niche technology companies and consultants. Our finance forum and other platforms supports member organisations from the investment, insurance and legal sectors that enable this growing economy.

## Our Sector Groups



Our various sector groups enable us to focus on sector-specific issues. Members can join our various groups concentrating on individual renewable technologies, energy market sectors, or cross-cutting issue forums.



## Our Subsidiaries



The Wood Heat Association is the UK trade association for the modern biomass heating industry.



Renewable Energy Assurance Ltd carries out a range of certification and consumer protection activities all of which promote sustainable energy.

# What we do

## Conferences, Seminars & Workshops



## Publications & Newsletters



## Growing Technology Sectors



# UK Renewable Energy Targets

**There are a number of legally binding targets driving forward decarbonisation**

## Renewable Energy Directive – EU (Subject to Brexit Negotiation)

- 15% of all energy to come from renewables by 2020
- Will require 30% power, 12% heat and 10% Transport demand to come from renewables

## Climate Change Act (2008) - UK

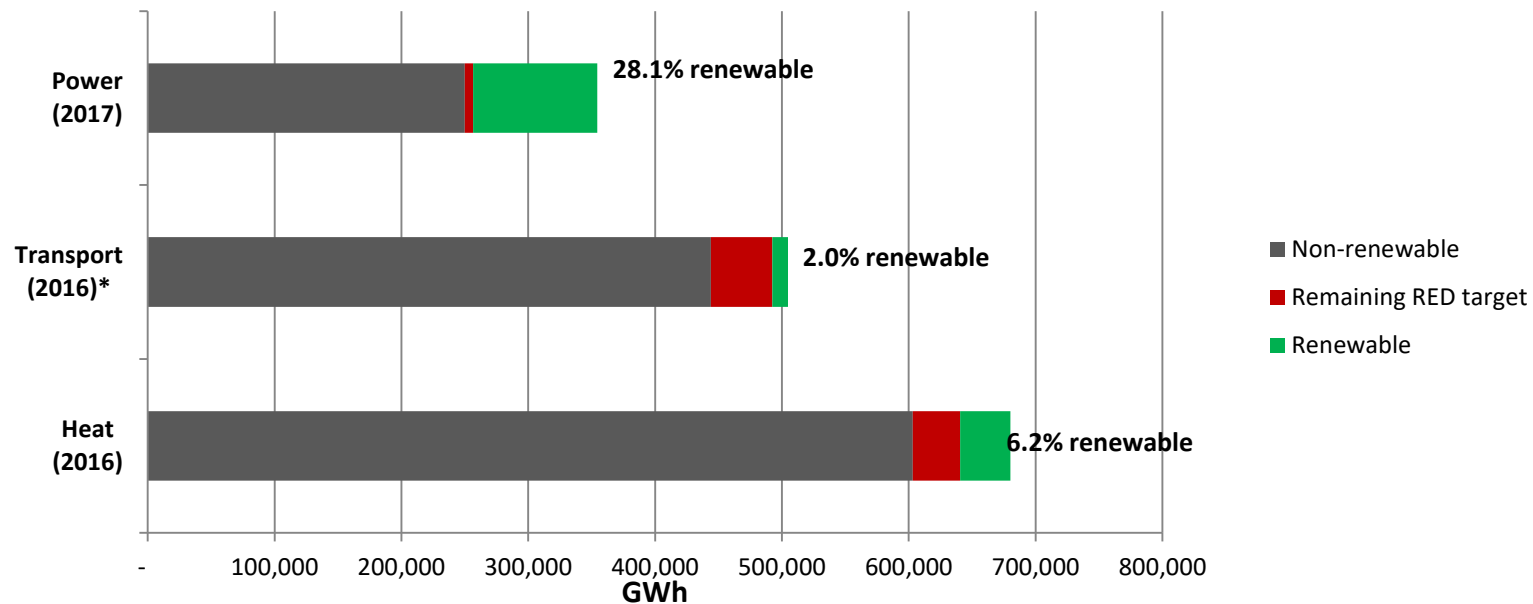
- 80% reduction in carbon emissions from 1990 levels by 2050
- 5<sup>th</sup> Carbon budget will require 57% reduction by 2032, abatement of 1725 MtCO<sub>2</sub>e. The agreement by government passed through parliament in July 2015

**Cop 21 Paris 2015 & COP 22 Marrakesh – UNFCCC**  
Agreed to aim for no more than 1.5°C warming

# Progress Against Renewable Energy Directive Targets

- 15% Renewable Energy Target by 2020
- Fourth interim target measuring average across 2017/18 expected to be about 10.2%
- Power essentially masking disappointing contributions from renewable heat and transport.

## UK Energy Consumption (GWh)

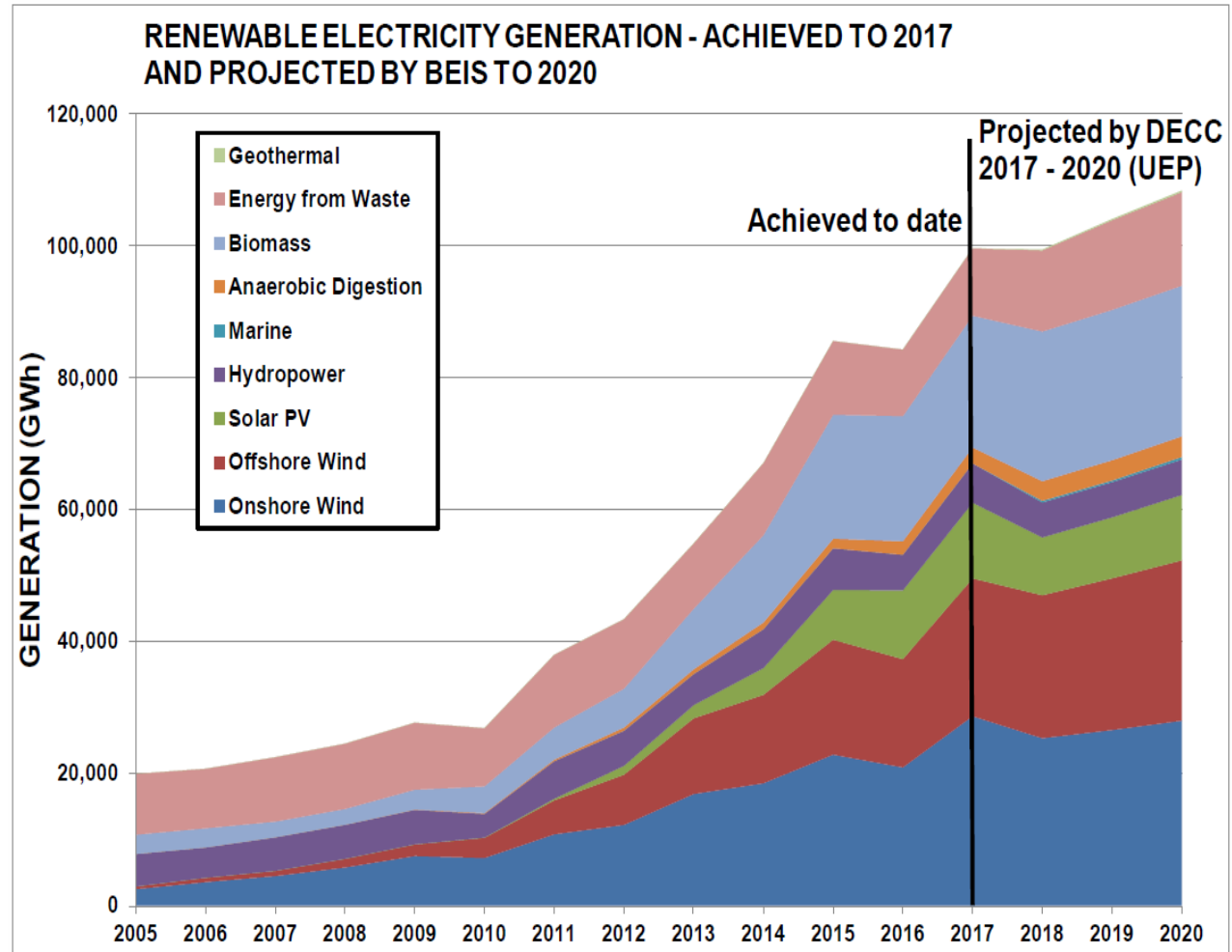




# Renewable Electricity was a record 29.4% in 2017

- An increase of 4.9% on 2016.
- Renewable Capacity at 40.5 GW at end of 2017.
- Bioenergy just under 1/3 of generation.

**Renewable electricity generation almost at 2020 target levels.**



## Generation in 2017:

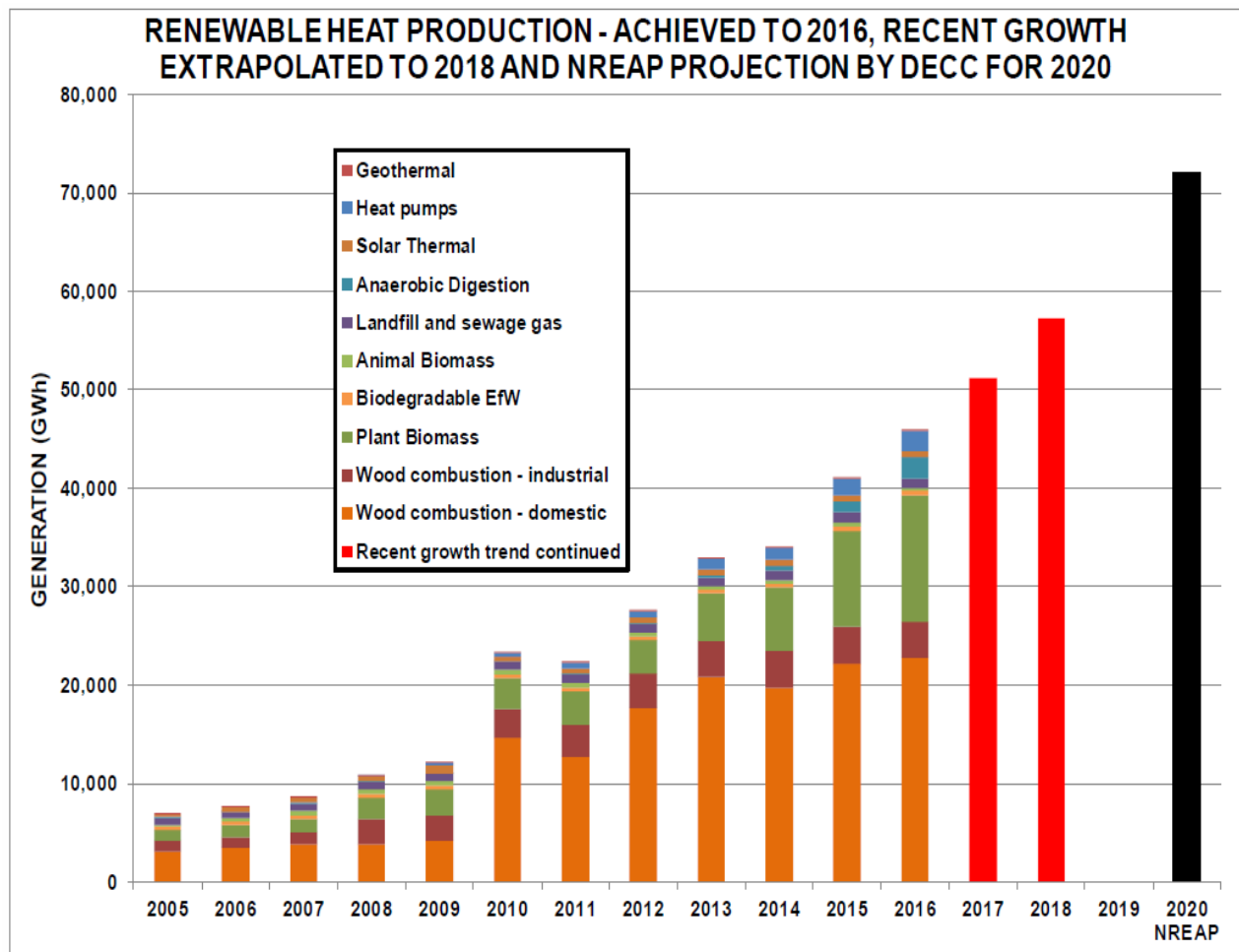
Bioenergy 32%  
Solar PV 12%

Onshore Wind 29%  
Hydro 6%

Offshore Wind 21%

# Renewable Heat is growing....but still a long way to go

- UK received **6.2%** of its heat from renewable sources in 2016, against a **12% target by 2020**
- 2018 saw Renewable Heat Incentives reforms come into force. Good news in terms of Tariff Guarantees, but support for biomass lowered.



## Heat generation source in 2016:

Solid Biomass: 86%    Heat Pumps: 4.6%  
EfW, landfill gas & sewage gas: 3.3%

Anaerobic Digestion: 4.5%  
Solar Thermal: 1.3%

# Renewable Transport remains behind RED Targets

Only 2.6% of transport was renewable in 2016 , compared against a 10% 2020 RED target.

## Renewable Transport Fuels

- In volume terms, bioethanol accounted for 4.5% of motor spirit, and biodiesel 2.3% of total diesel; the combined contribution to total road fuels was 3.1%, only a 0.2% increase on 2016.
- In 2017 the industry finally saw the Renewable Transport Fuel Obligation reviewed and the amendments came into force in mid-April 2018. Arguing for 10% Bioethanol in Petrol (#BE10%Good)

Follows recognition that transport now accounts for 27% of the UK's Greenhouse Gas emissions (GHGs).

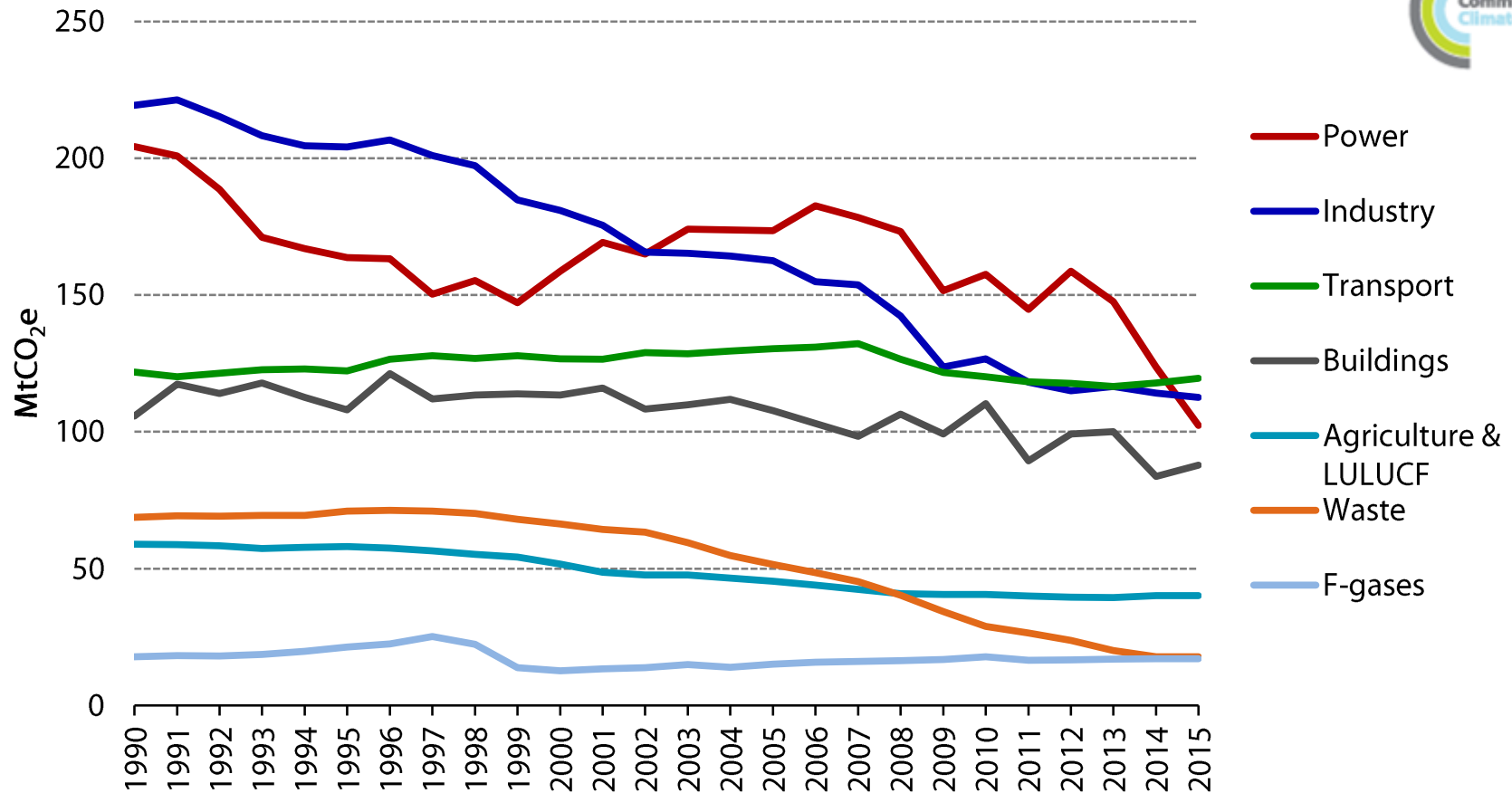
## Electric Vehicles

- EV car sales growth rate at **26%** and around **2%** of the UK's vehicle fleet now has a battery element.
- Dept. for Transport Report : 53,000 Ultra Low Emission Vehicles registered in 2017.
- However Committee on Climate Change (CCC) suggest 400,000 EVs will need to be on the road by 2020 to significantly contribute to transport emissions.





# Transport is now the biggest emitting sector



# Overall Outlook

## – Lots of Ambition but little Policy

- Are EU RED targets now of less relevance with Brexit?
- UK Gov. **Clean Growth Strategy** admits insufficient policies to meet 4<sup>th</sup> and 5<sup>th</sup> Carbon Budgets.
- UK **Industrial Strategy** has shown strong ambitions, especially on smart energy and electric vehicles, but is this too slow to meet commitments?
- Lack of a cohesive heat strategy to deploy renewable heat sources and address energy efficiency.
- Industry awaits the Waste & Resource Strategy, following the 25 Year Environment Plan, to see if Government can integrate the *circular economy*.

*UK Government have recently responded to challenges by the reviews of both the Committee on Climate Change and National Infrastructure Commission (Both well worth a read!)*

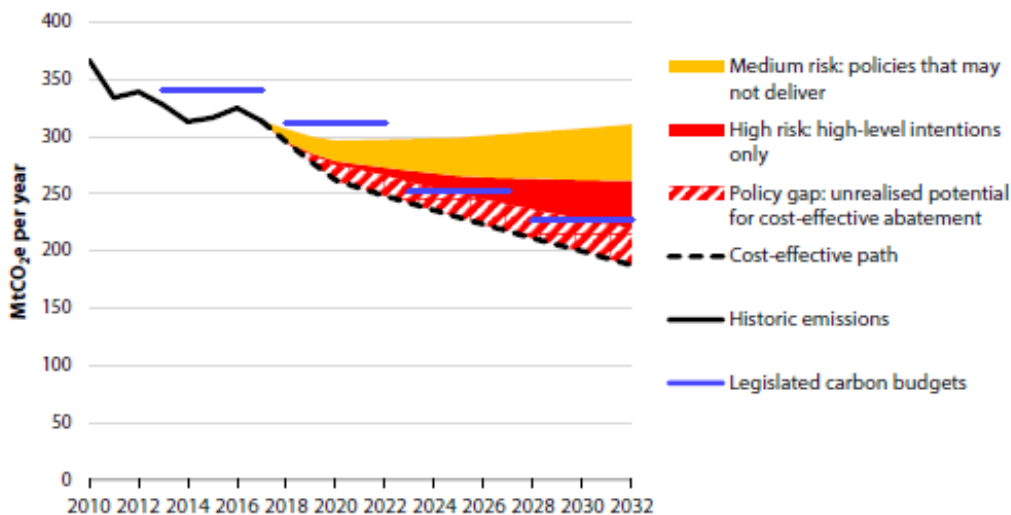
*Minister Clare Perry, BEIS, asked CCC to look at how to achieve a net zero carbon / <1.5°C world by 2050.*



# Are we on track to meet our carbon budgets?

## plus latest recommendations from Committee on Climate Change (CCC): June 2018

Figure 3. Risks remain around delivery of policies to meet the fourth and fifth carbon budgets



Source: BEIS (2018) 2017 UK Greenhouse Gas Emissions, Provisional Figures; BEIS (2018) 2016 UK Greenhouse Gas Emissions, Final Figures; HMG & HMT (2009) Building a low-carbon economy: implementing the Climate Change Act 2008; CCC analysis.



<https://www.theccc.org.uk/publication/reducing-uk-emissions-2018-progress-report-to-parliament/>

### Four messages to Government to put emissions reduction on track

#### Support the simple, low-cost options

- Onshore wind and Solar** are likely to be 25% cheaper than new gas plants by the 2020s. *see p102*
- Efficiency in buildings** is an obvious practical step. But insulation rates in homes are 95% lower than they were in 2012. *see p105*
- Tree planting** rates are two-thirds lower than they need to be. *see p102*
- Recycling food waste** reduces emissions. By 2025 all food waste should be recycled. *see p111*

Failure to pursue these options increases energy prices and adds to the cost of decarbonisation

#### End the chopping and changing of policy

Recent policies to reduce emissions have been cancelled...

- Zero carbon lease
- Carbon Capture and Storage
- Feed-in-Tariffs
- Efficiency measures in buildings

Progress towards targets

Misled opportunities for emissions reductions

Resulting in: Lower standards risking costly retrofit later. *see p111*

Higher future costs of decarbonising. *see p105*

50% fall in renewables investment between 2016-17. *see p11*

2020 jobs lost in energy efficiency. *see p101*

Consistent policies drive investment, cut bills and help to build UK business

#### Commit to effective regulation and strict enforcement

Poor enforcement and low standards result in...

- Wasted energy
- Higher bills
- Higher emissions

- Long EV waiting lists
- Higher fuel bills
- Worse air quality
- Higher emissions

Ambitious, strictly enforced standards drive innovation and protect consumers from being cheated. *see p104*

#### Act now to keep long-term options open

Infrastructure requires long-term investment

- Carbon Capture and Storage (CCS)** 2030s. *see p10*
- CCS could reduce the cost of decarbonising the UK by 50%
- Floating offshore wind** 2030s. *see p14*
- Floating offshore wind exemplifies an emerging low-carbon technology that could require support
- Heat pumps** 2030s. *see p10-4*
- Heat pumps could be crucial to decarbonising heat in UK buildings

Further delays will increase costs and reduce options

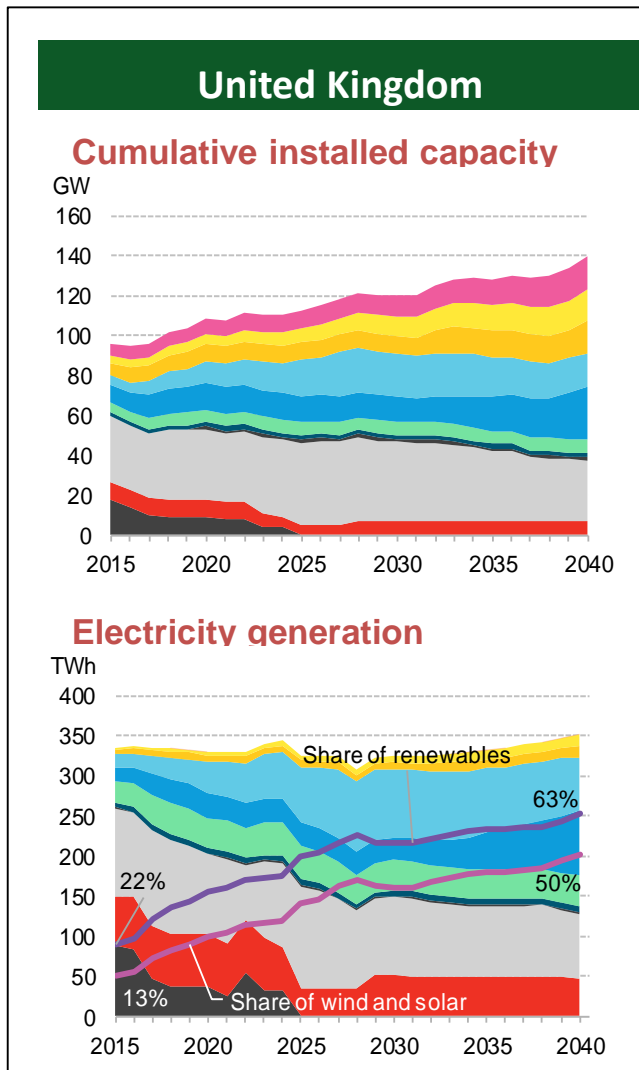
# Could there be optimism for investors in low carbon infrastructure?

**YES!**

- Falling cost of solar, wind, batteries and other technologies... **TIPPING POINT**
- Unsubsidised solar projects starting to be investable
- Growth in Demand Side Response with TECH developments
- Deployment of EVs also requiring grid infrastructure investment
- Renewable Heat Incentive finally reformed
- Renewable Transport Fuel Obligation has come into force

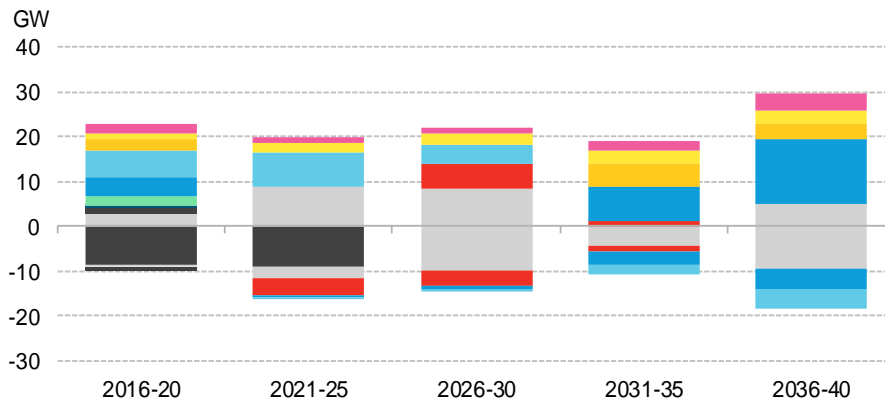


# Forecasts for United Kingdom

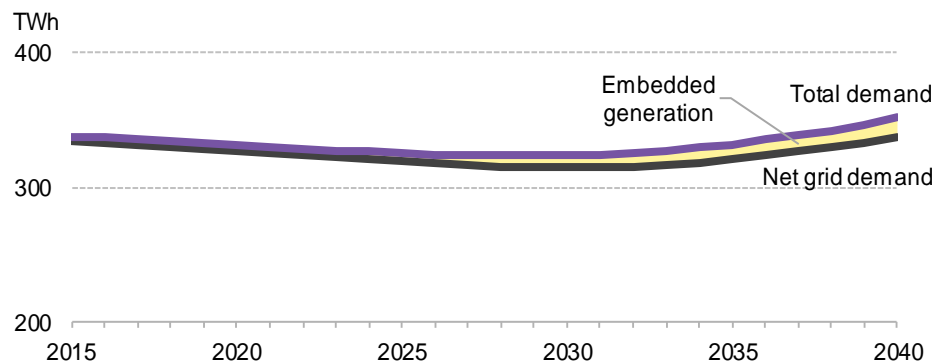


## Modeling assumptions

- Additions and retirements



- Electricity demand



■ Coal ■ Nuclear ■ Gas ■ Oil ■ Other ■ Hydro ■ Biomass ■ Onshore wind ■ Offshore wind ■ Utility-scale PV ■ Small-scale PV ■ Flex

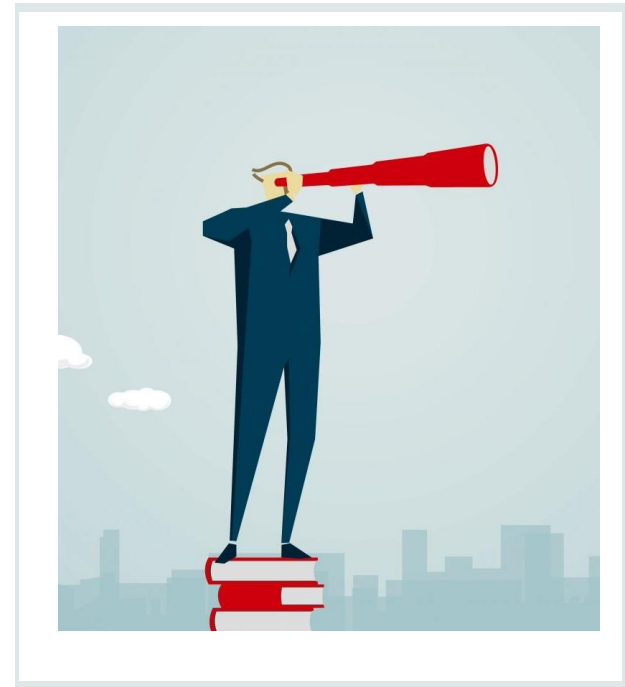


# Looking Forward

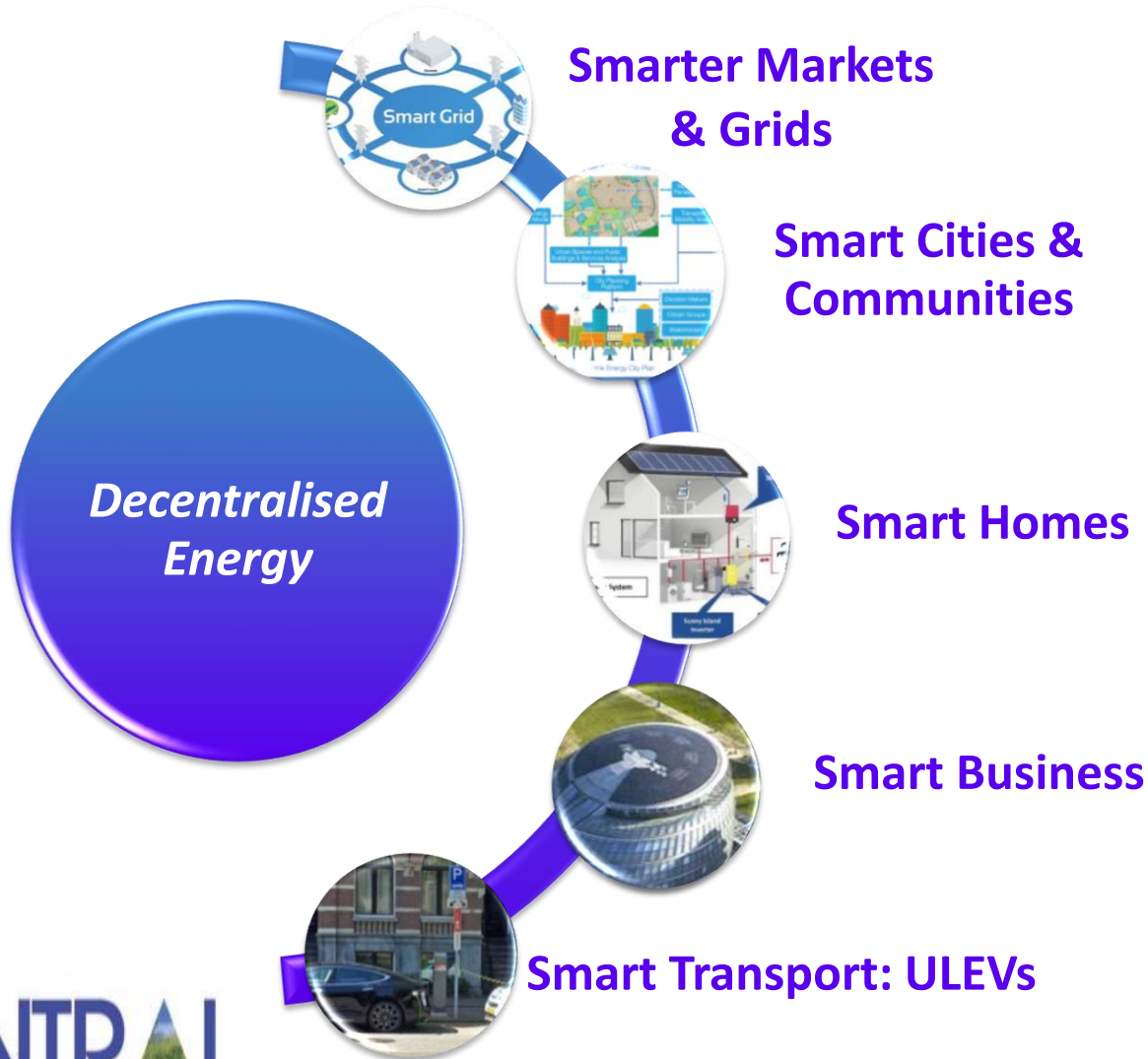
With so much uncertainty, including Brexit, it is difficult to provide realistic forecasted projections.

## Yet, some positive trends are clear:

- EU Clean Energy Package will continue to raise ambitions
- UK is maintaining the Climate Change Act and remains committed to the COP 21 Paris Agreement
- Countries like China and India are rapidly deploying 100GWs of renewable energy
- Large international corporations continue to make strong commitments to reducing carbon footprint – RE100
- Renewables are amongst the **cheapest forms of generation, calling into question future investment in nuclear and gas.**
- Energy storage addresses solar and wind variability.
- Electric Vehicle deployment only likely to increase in coming years.
- **The democratisation and decentralisation of energy is providing new opportunities for consumers and business.**



# Changing Landscape: *the NEW normal?*



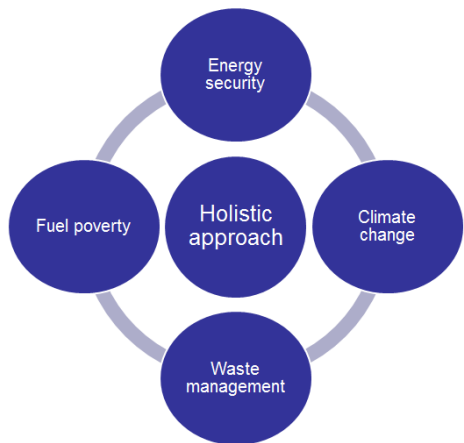
# *Decentralised Energy ...some examples (if time)*



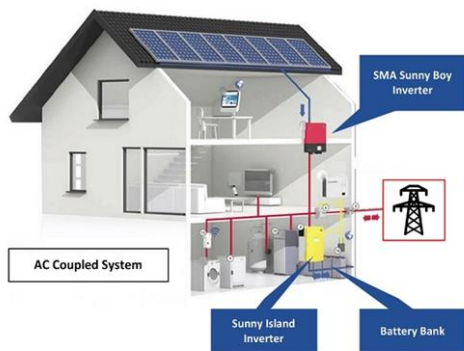
# Decentralised Energy: Smart Cities

Excellent example is the work of Nottingham city & Robin Hood Energy

## Municipal Energy = holistic



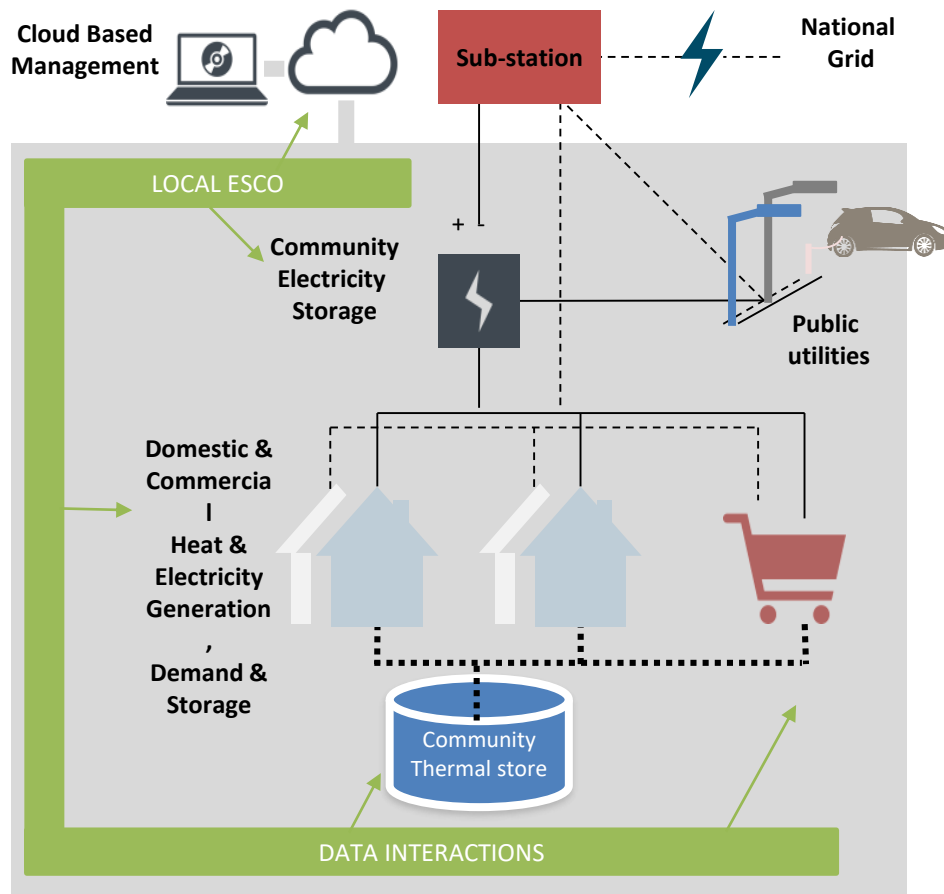
Storage-Enabled Sustainable Energy for Buildings and Communities



- €15M project run by UoN, funded by EU H2020
- aims to make communities more resilient to changes in energy provision by addressing issues surrounding energy distribution and storage.
- Demonstration on The Meadows



## SCENE will demonstrate scalable Energy Supply Company services



# Decentralised Energy: Smart Cities

More examples from Nottingham city

## Combined Heat and Power

- Incinerator burns 180,000 Tonnes of non-recyclable waste per year – part renewable as 65% is biomass
- CHP takes steam and hot water from EfW plant, drives 2 turbines
- Produces 60,000 MWh of electricity and 190,000 MWh of heat



## Distribution: District heating and power

- Heats 5000 homes, many in fuel poverty
- Heats 150 business
- **Displaces 27,000 tonnes of fossil fuel per year**

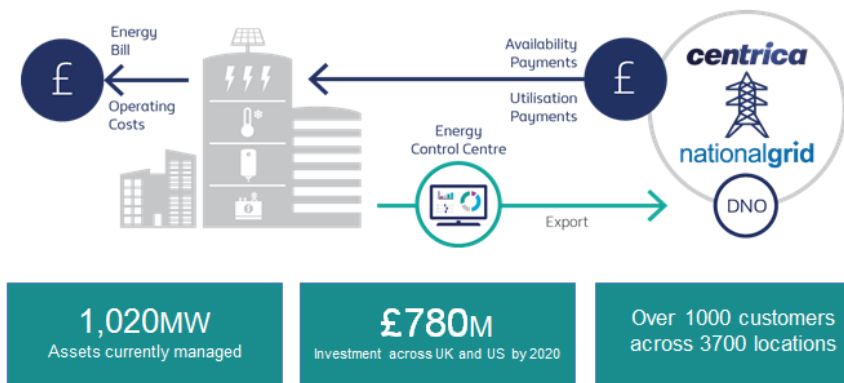




# Decentralised Energy: Smart Business

Total solution providers, such as British Gas, E.ON, and new entrants “aggregators” Limejump, support business and organisations to a low carbon economy

## The Distributed Energy model

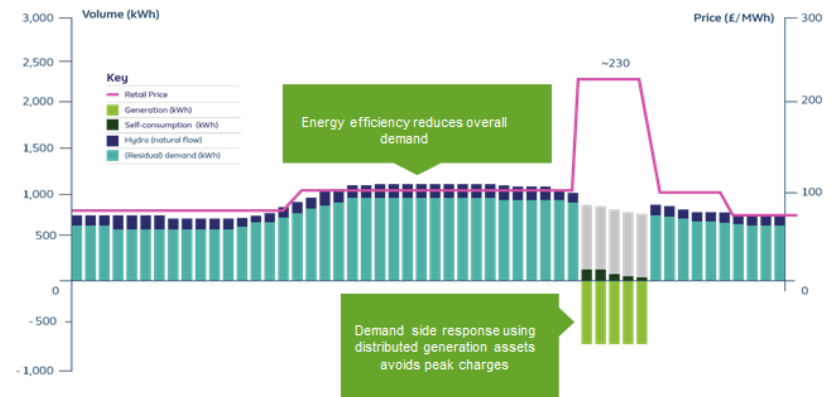


DISTRIBUTEDENERGY | **centrica**

## Peak avoidance - Distribution Use of System Charges (DUoS)

High charges (Red band rates) are typically applied between 4:00-7:00pm Monday to Friday to disincentivise consumption in that period.

Exemplary calculation: Customer with 12.4 GWh yearly consumption



DISTRIBUTEDENERGY | **centrica**

# *Decentralised Energy:*

## Smart Business – Storage for commercial buildings

- Commercial buildings that operate 24/7 can have a variety of electricity pricing levels
- Storage allows the shifting of electricity from low cost points to high cost times and so reduce overall electricity costs
- Solar on roof with storage allows greater capacity to be installed and all electricity generated used in the building



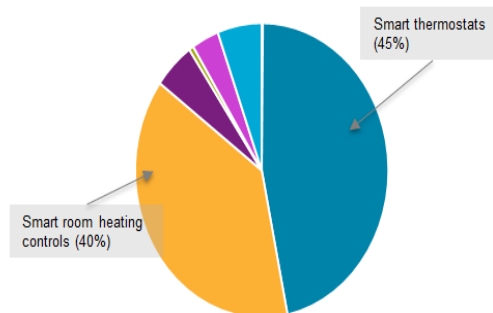
# Decentralised Energy: Smart Homes

Companies like Delta show how different products can improve energy consumption in homes and play a part in demand management of systems

More than 1.3M European households equipped with connected home energy products in 2015



Shares by types of products



- Smart thermostat
- Multi zonal TRV/room thermostat system
- Remote diagnostic
- Tariff optimisation
- Microgen optimisation
- Gateway with possible heating control add on

Smart thermostats and room heating controls account for around 85% of the installations – they are led by EQ-3, Hive and Quby

Other niche products start to emerge with Home Energy Management functionalities

## Smart thermostats



## Connected room heating controls



## Others



### Smart diagnostics

Part of our Remeha boiler range include built in predictive controls that notify your installer when a problem occurs to avoid breakdown.



# *Decentralised Energy:* Smart Homes

2 million new homes required

Pressure coming to make the houses sustainable

Solar will be specified by many Planners

Modular housing is happening with Solar fitted in the factory

Storage can also be integrated



# Battery Storage – Domestic scale

## Tesla Powerwall, Moixa Battery, Sonnen, Powervault

- Small units (c.1-5kWp), installed in homes & offices
- Aggregated up and used as *'Virtual Power Plant'*
- Provides ancillary services, and arbitrage
- Installed cost c.£3-5,000 for 2kWp Battery, 2 kWp Solar PV, and inverter (£2,500 2kWp battery only)
- Use sophisticated software to manage charging/discharging





# *Decentralised Energy:*

## Smart Homes: linking homes, storage and EVs

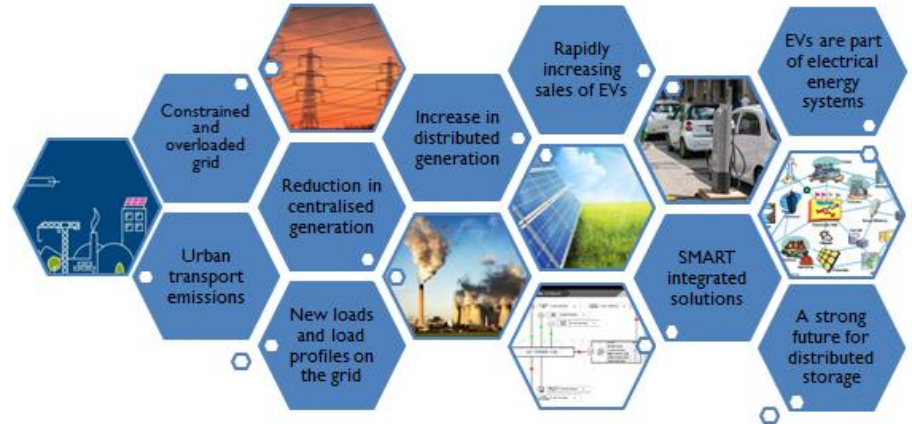
- Charge in daytime (at work)
- Using Renewables for totally clean energy/battery power
- Plug in at home and power your house in the evening
- Or run your fuel cell car at night from *Hydrogen* (clean, no pollution and silent)



# Decentralised Energy: Smart Transport: Ultra Low Emission Vehicles

Many companies, like Connected Energy, show how Electric Vehicles and storage can play a part in smart businesses and wider smart cities infrastructure

## Context

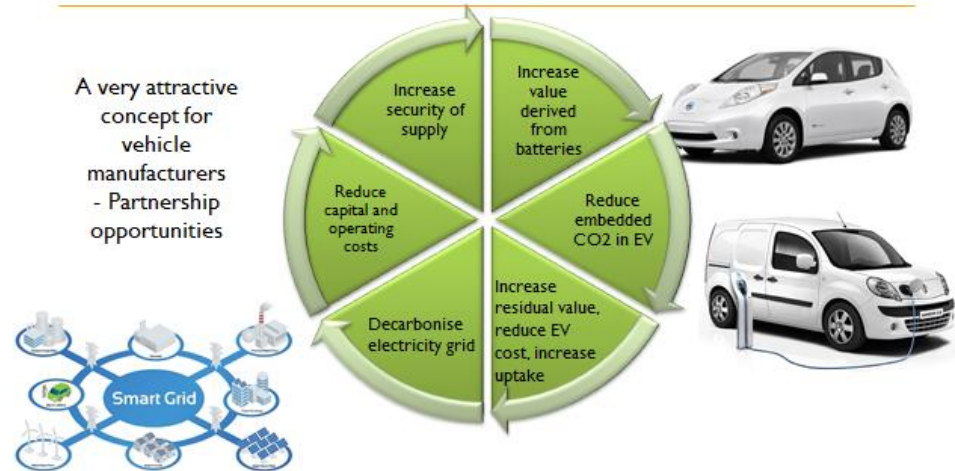


[www.c-e-int.com](http://www.c-e-int.com)



## Battery reuse and sustainability

A very attractive concept for vehicle manufacturers - Partnership opportunities



2018  
**REVIEW**  
RENEWABLE ENERGY VIEW  
THE AUTHORITATIVE ANNUAL REPORT  
ON THE UK RENEWABLE ENERGY SECTOR

Available Online:

<https://www.r-e-a.net/resources/rea-publications>



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